Developing a Model for Enhancing the Quality of Financial Reporting Based on Cloud Accounting Using the Interpretive Structural Modeling (ISM) Approach

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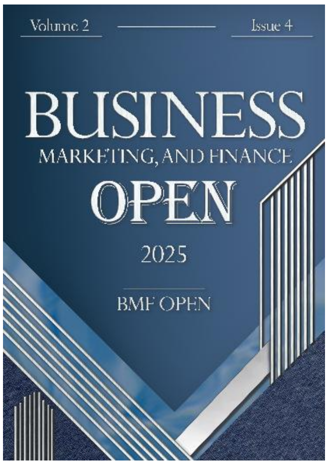

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Abstract: This study was conducted with the aim of developing a model to enhance the quality of financial reporting based on cloud accounting using the Interpretive Structural Modeling (ISM) approach. The research was carried out from the beginning of winter 2023 to the end of autumn 2024 (Gregorian Calendar). The data required for ISM-based modeling were gathered through interviews with 18 accounting experts and senior auditors who held master's or doctoral degrees in accounting and had at least five years of experience in cloud accounting. In this study, ISM was used to construct a model for improving the quality of financial reporting grounded in cloud accounting. The results of the interpretive structural analysis (ISM), derived through the exploratory model, indicated that the hardware factors of cloud accounting—including process automation, advanced scalability, cloud and virtual network servers, management and support tools, and workstations—along with the software factors of cloud accounting—such as flexibility and continuous improvement, scalability, information security, ease of use, performance and analysis speed, remote data recovery, and automated reporting—contribute to enhancing the quality of financial reporting. This enhancement is achieved through dimensions such as improved transparency, increased accuracy in automated reporting, error reduction, improved calculations, and data protection.

Keywords: Cloud accounting, quality of financial reporting, financial reporting.

1. Introduction

Given the informational needs of accounting users and the limitations of the traditional model, along with the necessity of adopting new information technologies, it becomes evident that accounting must ultimately move toward real-time operation. Accordingly, it is necessary to design and develop accounting and auditing security systems compatible with modern technologies and to align accounting and financial reports with the rapid changes occurring in the business world. As a result, business process outsourcing markets have rapidly expanded, and companies now delegate a broader range of business functions to professional service providers [1].

The increasing trend of business process outsourcing can be attributed to the growing use of cloud-based information systems, which facilitate outsourcing by reducing transaction costs [2]. Given the features of information technology—including speed, intensity, and high quality—as well as the possibility of electronic information exchange, there is no longer a need to justify the use of information technology in today's world. The accounting profession is no exception and is inevitably compelled to apply some or all of these new methods and techniques in delivering its services and responsibilities [3].

It can be stated that in the near future, cloud accounting will completely surpass traditional accounting and dominate the field. Despite the vast potential of cloud computing and cloud accounting in delivering improved services and generating value, its acceptance and implementation have been overlooked by researchers [4].

Cloud accounting is one of the increasingly heard terms in the financial domain and is often referred to by other names such as web-based, online, or internet accounting, although these concepts have some differences. Cloud accounting is an accounting system whose solution is executed through a workstation and remote servers, where data are transmitted to the cloud to be processed and stored. This allows employees to manage, maintain, and update information daily with greater transparency and cooperation, granting business owners more peace of mind [5, 6].

Thus, cloud accounting can be defined as a type of parallel and distributed system composed of a set of interconnected and virtualized computers dynamically provisioned and presented as one or more unified computing resources according to a service-level agreement [7, 8].

Cloud computing was recognized as one of the most exciting technological trends of 2021 and is expected to impact global GDP in the coming years. Additionally, this technology has facilitated remote work and operational continuity and enabled the analysis of workspaces. Cloud computing data and infrastructure—enhanced through machine learning—have led to improvements across all fields, particularly in information systems management. Accounting in the technology era is being transformed by cloud computing. Along this path, Richardson and Yigitbasioglu (2018) discussed business intelligence and big data analytics in accounting management [9].

Cloud computing service models combine a general organizing principle for IT transformation, infrastructure components, an architectural approach, and an economic model. The capabilities of acquiring resources, utilizing, and maintaining cloud computing infrastructure enable clients to access and use software-as-a-service (SaaS), platform-as-a-service (PaaS), or infrastructure-as-a-service (IaaS), which in turn reduces their total cost of ownership. The cloud computing chain is a service delivery process chain that includes service deployment, comprehensive monitoring, accounting and billing, and providing both technical and business information [10].

The infrastructure supporting cloud computing increases customization, flexibility, and scalability in acquiring, using, and maintaining resources, allowing a wider variety of customers and applications to be served from a single data center. However, even with advanced technical knowledge for measuring and scaling computing resources on demand, many large organizations remain hesitant to adopt cloud computing. One potential reason is their uncertainty about the impact of such changes on their overall IT landscape [6].

Cloud computing is considered a modern paradigm of information technology and operates based on outsourcing data storage and processing. Cloud computing provides services in an ecosystem characterized by reliable, flexible, cost-effective, and secure infrastructure with quality assurance. These services can range from the storage and processing of global library data to accounting and financial data for businesses, or even hospital patient records. Today, many organizations and institutions emphasize outsourcing their IT services in response to various IT challenges (e.g., storage, processing, transmission), particularly more complex issues, considering it to be more effective, efficient, and cost- and time-saving [7, 8]. The existence of cloud computing has brought about a transformation and has had a direct impact on the future of accounting. Cloud service providers are also developing cloud-based accounting applications. Accounting software based on cloud systems functions as an integrated accounting application operating on a server and accessible via a web browser. This has changed the accounting method within companies. In a 2018 survey, approximately 67% of accountants believed that cloud technology could simplify accounting tasks [5]. In the era of globalization, access to high-quality information has become a vital need, especially in the field of accounting. This highlights the necessity of a cloud accounting system used by accountants. The adoption of cloud accounting is essential as it is seen as a solution to current problems and challenges.

One such problem is the rigid accounting system employed by companies for managing transactional accounting processes, which are often inefficient or unable to integrate with other systems. In the traditional system, computers and data can only be transferred via physical drives or hard disks. This form of financial data storage is insecure and unreliable [5, 11].

In reviewing the literature on cloud accounting adoption and implementation, several studies have identified key technological, organizational, and contextual factors influencing its acceptance. Zibwa and Widuri (2023) analyzed cloud accounting acceptance in Indonesia, finding that top management support, organizational competence, service quality, and system quality significantly affect perceived usefulness and ease of use, which in turn shape behavioral intentions. Al-Okaily et al. (2023), focusing on Jordan's SMEs post-COVID-19, extended the UTAUT model and revealed that performance expectancy, social influence, perceived COVID-19 risk, and trust significantly predicted behavioral intention to use cloud-based accounting information systems, while effort expectancy and perceived security risk did not [10]. Ouaadi and El-Haddad (2022), through a combined TOE, DOI, and TAM framework, demonstrated that factors such as intention of use, motivation, remote reporting, and firm size influence cloud accounting adoption [10]. Tawfik et al. (2022) confirmed in Omani SMEs that compatibility, top management support, firm size, and infrastructure readiness strongly impact cloud accounting adoption [12]. Additionally, Mahmoudi et al. (2023), using a grounded theory approach, proposed a sustainability reporting model for listed Iranian companies, integrating environmental, cultural, and governance variables that also intersect with cloud accounting via reporting quality and technological capabilities [13]. Sarraf et al. (2022) examined outsourcing decisions in cloud accounting, finding that task repetition, information intensity, skilled labor, and customer interaction positively influence adoption, while uncertainty has a significant negative impact [4]. Lastly, Bayzidi and Ahmadi Dehrashid (2021) explored the role of the Internet of Things (IoT) in accounting and auditing, highlighting how digitalization and Industry 4.0 technologies are reshaping these functions and reinforcing the importance of integrating innovative infrastructure into cloud-based financial systems [14].

Based on the above, the implementation of cloud computing technology in accounting—due to its underlying infrastructure—enables big data analysis and classification for the profession and creates opportunities to enhance transparency and the quality of financial reporting across various segments of the accounting field. Given the high importance of financial reporting, and the fact that decision-makers in industry, investors, banks, and governments rely on it for financial decisions, improving the quality of financial reporting is of great significance. Moreover, adopting cloud-based accounting solutions can help reduce financial fraud. As financial fraud remains a serious challenge in Iran, cloud technologies may offer significant improvements in this area. Therefore, identifying and prioritizing cloud-based accounting solutions in Iran can lead to substantial improvements in the financial reporting process and reductions in financial fraud, thereby contributing to the enhancement of financial reporting quality in the country.

2. Methodology

The present study is classified as an applied and exploratory research in terms of its purpose, and its tools can be employed to develop a model for enhancing the quality of financial reporting based on cloud accounting using the Interpretive Structural Modeling (ISM) approach. In this research, a mixed-methods approach was used. Mixed-methods research is characterized by the combination of qualitative outcomes within a single or multi-stage study design. The fundamental principle of mixed-methods research is the integration of qualitative methods at certain stages of the study, which may be implemented either concurrently or sequentially, so that their strengths complement and their weaknesses do not overlap.

In terms of chronological sequence, qualitative data were collected first, followed by quantitative data. Subsequently, secondary interviews were conducted to validate the findings. In this study, priority was given to qualitative data collection, while quantitative data were gathered to deepen understanding and strengthen the investigation. One reason for adopting this sequence was that qualitative research adequately explores the problem and can initially identify the most relevant constructs, variables, and classifications for testing. It also significantly aids in recognizing and defining factors and scales necessary for developing quantitative tools. However, qualitative exploration alone is not sufficient, and a quantitative component is needed for a more comprehensive understanding of the research problem.

Therefore, this study explicitly employs an exploratory mixed-methods design. In this framework, the research begins with a qualitative phase and continues with a quantitative phase. Accordingly, qualitative data were first collected through interviews with experts, and then, to follow up and enrich the inquiry, quantitative data were collected via a questionnaire. In this study, the qualitative phase was used to extract the components, and then a conceptual model was developed using the Interpretive Structural Modeling (ISM) approach.

3. Findings and Results

In this study, data analysis was conducted using the Content Validity Ratio (CVR) index and the ISM approach, which will be explained step by step. At this stage, the CVR was used to determine the content validity ratio for each factor. To this end, a questionnaire was distributed among experts, asking them to assess each factor and dimension using a 3-point Likert scale: "essential," "useful but not essential," and "not essential." Since the number of experts was 18, if the CVR value of any factor exceeded 0.49, its content validity would be confirmed. The results of the CVR analysis are presented in Table 1.

Table 1. CVR Values for Each Factor

No.	Factors	CVR	Result	Dimensions	CVR	Result
1	Process automation	1	Confirmed	Cloud Accounting Hardware Factors	1	Confirmed
2	Advanced scalability	1	Confirmed			
3	Cloud and virtual network servers	1	Confirmed			
4	Management and support tools	1	Confirmed			
5	Workstations	1	Confirmed			
6	Flexibility and continuous improvement	1	Confirmed	Cloud Accounting Software Factors	1	Confirmed
7	Scalability	1	Confirmed			
8	Information security	1	Confirmed			
9	Ease of use of cloud accounting	1	Confirmed			
10	Performance and analysis speed	1	Confirmed			
11	Data recovery capability	1	Confirmed			
12	Remote automated reporting	1	Confirmed			
13	Improved transparency	1	Confirmed	Quality Enhancement in Financial Reporting	1	Confirmed

14	Increased accuracy in automated reporting	1	Confirmed
15	Error reduction and improved calculations	1	Confirmed
16	Data protection	1	Confirmed

The results indicated that all 16 factors and all 3 dimensions were accepted, and experts reached full consensus on them for model design.

Step 1: Identification of Factors Related to the Problem

As detailed in the previous section, 16 factors were categorized into 3 dimensions. These factors were validated using the CVR index. All 16 factors within the 3 dimensions were confirmed by experts. Therefore, these 16 factors were used to develop a model of factors influencing the application of cloud accounting in enhancing the quality of financial reporting.

Table 2. Identified Factors for Model Design

No.	Factors
1	Process automation
2	Advanced scalability
3	Cloud and virtual network servers
4	Management and support tools
5	Workstations
6	Flexibility and continuous improvement
7	Scalability
8	Information security
9	Ease of use of cloud accounting
10	Performance and analysis speed
11	Data recovery capability
12	Remote automated reporting
13	Improved transparency
14	Increased accuracy in automated reporting
15	Error reduction and improved calculations
16	Data protection

Step 2: Formation of the Structural Self-Interaction Matrix (SSIM)

After determining the factors, the ISM questionnaire was designed. Experts assessed these factors in pairs and determined the relationships among them using the following symbols:

- **V**: Factor *i* influences factor *j*
- **A**: Factor *j* influences factor *i*
- **X**: Factors *i* and *j* influence each other
- **O**: No relationship exists between factors *i* and *j*

The results from the completed questionnaires regarding the relationships among the factors are presented in Table 3.

Table 3. Results Obtained from the Questionnaires

No.	Factors	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	Process Automation		X	X	X	X	V	V	V	V	V	V	V	V	V	V	V
2	Advanced Scalability			X	X	X	V	V	V	V	V	V	V	V	V	V	V
3	Cloud and Virtual Network Servers				X	X	V	V	V	V	V	V	V	V	V	V	V
4	Management and Support Tools					X	V	V	V	V	V	V	V	V	V	V	V

5	Workstations						V	V	V	V	V	V	V	V	V	V	V
6	Flexibility and Continuous Improvement							X	X	X	X	X	X	V	V	V	V
7	Scalability								X	X	X	X	X	V	V	V	V
8	Information Security									X	X	X	X	V	V	V	V
9	Ease of Use in Cloud Accounting										X	X	X	V	V	V	V
10	Performance and Analysis Speed											X	X	V	V	V	V
11	Data Recovery Capability												X	V	V	V	V
12	Remote Automated Reporting													V	V	V	V
13	Improved Transparency														X	X	X
14	Increased Accuracy in Automated Reporting															X	X
15	Error Reduction and Improved Calculations																X
16	Data Protection																

Step 3: Formation of the Initial Reachability Matrix

The initial reachability matrix is obtained by converting the Structural Self-Interaction Matrix (SSIM) into a binary matrix (comprising only zeros and ones). The following transformation rules were used to replace the four symbolic entries of Table 3 with binary values:

1. If the entry (i, j) in the SSIM is **V**, then the entry (i, j) in the reachability matrix is 1 and (j, i) is 0.
2. If the entry (i, j) in the SSIM is **A**, then the entry (i, j) in the reachability matrix is 0 and (j, i) is 1.
3. If the entry (i, j) in the SSIM is **X**, then both (i, j) and (j, i) in the reachability matrix are 1.
4. If the entry (i, j) in the SSIM is **O**, then both (i, j) and (j, i) in the reachability matrix are 0.

Table 4. Initial Reachability Matrix

No.	Factors	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	Process Automation	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	Advanced Scalability	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
3	Cloud and Virtual Network Servers	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
4	Management and Support Tools	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
5	Workstations	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
6	Flexibility and Continuous Improvement	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1
7	Scalability	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1
8	Information Security	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1
9	Ease of Use in Cloud Accounting	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1
10	Performance and Analysis Speed	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1
11	Data Recovery Capability	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1
12	Remote Automated Reporting	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1
13	Improved Transparency	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1
14	Increased Accuracy in Automated Reporting	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1
15	Error Reduction and Improved Calculations	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1
16	Data Protection	0	0	0	0	0	0										

Step Four: Formation of the Final Reachability Matrix

Once the initial reachability matrix was developed, secondary relationships among the factors were examined. A secondary relationship is such that if factor *i* leads to factor *j*, and factor *j* leads to factor *k*, then factor *i* will also lead to factor *k*. If this condition is not met in the initial reachability matrix, the matrix must be revised and the missing relationships inserted. This process is referred to as *matrix compatibility*. In this step, all secondary relationships among the factors were examined, and no new secondary relationships were found. Therefore, the final reachability matrix is identical to the initial reachability matrix. In this matrix, the *driving power* and *dependence* of each factor are also displayed. Driving power is determined by the total number of factors influenced by a given factor plus the factor itself, while dependence is calculated as the total number of factors that influence a given factor, including itself.

Table 5. Final Reachability Matrix

No.	Factors	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Driving Power
1	Process Automation	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	16
2	Advanced Scalability	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	16
3	Cloud and Virtual Network Servers	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	16
4	Management and Support Tools	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	16
5	Workstations	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	16
6	Flexibility & Continuous Improvement	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	11
7	Scalability	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	11
8	Information Security	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	11
9	Ease of Use in Cloud Accounting	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	11
10	Performance & Analysis Speed	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	11
11	Data Recovery Capability	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	11
12	Remote Automated Reporting	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	11
13	Improved Transparency	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	4
14	Accuracy in Automated Reporting	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	4
15	Error Reduction & Better Calculations	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	4
16	Data Protection	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	4
Dependence		5	5	5	5	5	12	12	12	12	12	12	12	16	16	16	16	

Step Five: Determining Relationships and Factor Leveling

In this step, using the reachability matrix, the *reachability sets* and *antecedent sets* were determined for each factor.

1. A factor's *reachability set* includes the factor itself and all other factors it influences. This is identified by the "1"s in its corresponding row.
2. A factor's *antecedent set* includes the factor itself and all factors that influence it. This is identified by the "1"s in its corresponding column.

Next, the intersection of these two sets was calculated for each factor. The factors whose reachability set and intersection set are identical were placed in the highest level of the Interpretive Structural Modeling (ISM) hierarchy. These highest-level components were then removed from the matrix, and the process was repeated to determine the next level, continuing until all hierarchical levels of the system were identified.

Table 6. Leveling (Iteration 1)

No.	Factors	Reachability Set	Antecedent Set	Intersection Set	Level
1	Process Automation	1–16	1–5	1–5	
2	Advanced Scalability	1–16	1–5	1–5	
3	Cloud and Virtual Network Servers	1–16	1–5	1–5	
4	Management and Support Tools	1–16	1–5	1–5	
5	Workstations	1–16	1–5	1–5	
6	Flexibility and Continuous Improvement	6–16	1–12	6–12	

7	Scalability	6–16	1–12	6–12	
8	Information Security	6–16	1–12	6–12	
9	Ease of Use in Cloud Accounting	6–16	1–12	6–12	
10	Performance and Analysis Speed	6–16	1–12	6–12	
11	Data Recovery Capability	6–16	1–12	6–12	
12	Remote Automated Reporting	6–16	1–12	6–12	
13	Improved Transparency	13–16	1–16	13–16	1
14	Increased Accuracy in Automated Reporting	13–16	1–16	13–16	1
15	Error Reduction and Improved Calculations	13–16	1–16	13–16	1
16	Data Protection	13–16	1–16	13–16	1

As shown in Table 6, the reachability and intersection sets for factors 13, 14, 15, and 16 are completely identical; therefore, they are positioned at Level 1. These factors are removed from the next iteration of the leveling process. The next table shows Iteration 2 of the leveling procedure.

Table 7. Leveling (Iteration 2)

No.	Factors	Reachability Set	Antecedent Set	Intersection Set	Level
1	Process Automation	1–12	1–5	1–5	
2	Advanced Scalability	1–12	1–5	1–5	
3	Cloud and Virtual Network Servers	1–12	1–5	1–5	
4	Management and Support Tools	1–12	1–5	1–5	
5	Workstations	1–12	1–5	1–5	
6	Flexibility and Continuous Improvement	6–12	1–12	6–12	2
7	Scalability	6–12	1–12	6–12	2
8	Information Security	6–12	1–12	6–12	2
9	Ease of Use in Cloud Accounting	6–12	1–12	6–12	2
10	Performance and Analysis Speed	6–12	1–12	6–12	2
11	Data Recovery Capability	6–12	1–12	6–12	2
12	Remote Automated Reporting	6–12	1–12	6–12	2

As shown in Table 7, the reachability and intersection sets of factors 6 through 12 are identical. Therefore, these factors are placed in Level 2 and are removed from the next iteration.

Table 8. Leveling (Iteration 3)

No.	Factors	Reachability Set	Antecedent Set	Intersection Set	Level
1	Process Automation	1–5	1–5	1–5	3
2	Advanced Scalability	1–5	1–5	1–5	3
3	Cloud and Virtual Network Servers	1–5	1–5	1–5	3
4	Management and Support Tools	1–5	1–5	1–5	3
5	Workstations	1–5	1–5	1–5	3

As shown in Table 8, the reachability and intersection sets for factors 1 through 5 are completely identical. Hence, these factors are placed in Level 3 (final). The leveling process is now complete.

Step Six: Drawing the Final Model

At this stage, based on the factor levels and the final reachability matrix, an initial model is constructed. By removing transitive links, the final ISM model is derived. Thus, the final ISM model of the factors influencing the application of cloud accounting to improve the quality of financial reporting is depicted in Figure 1.

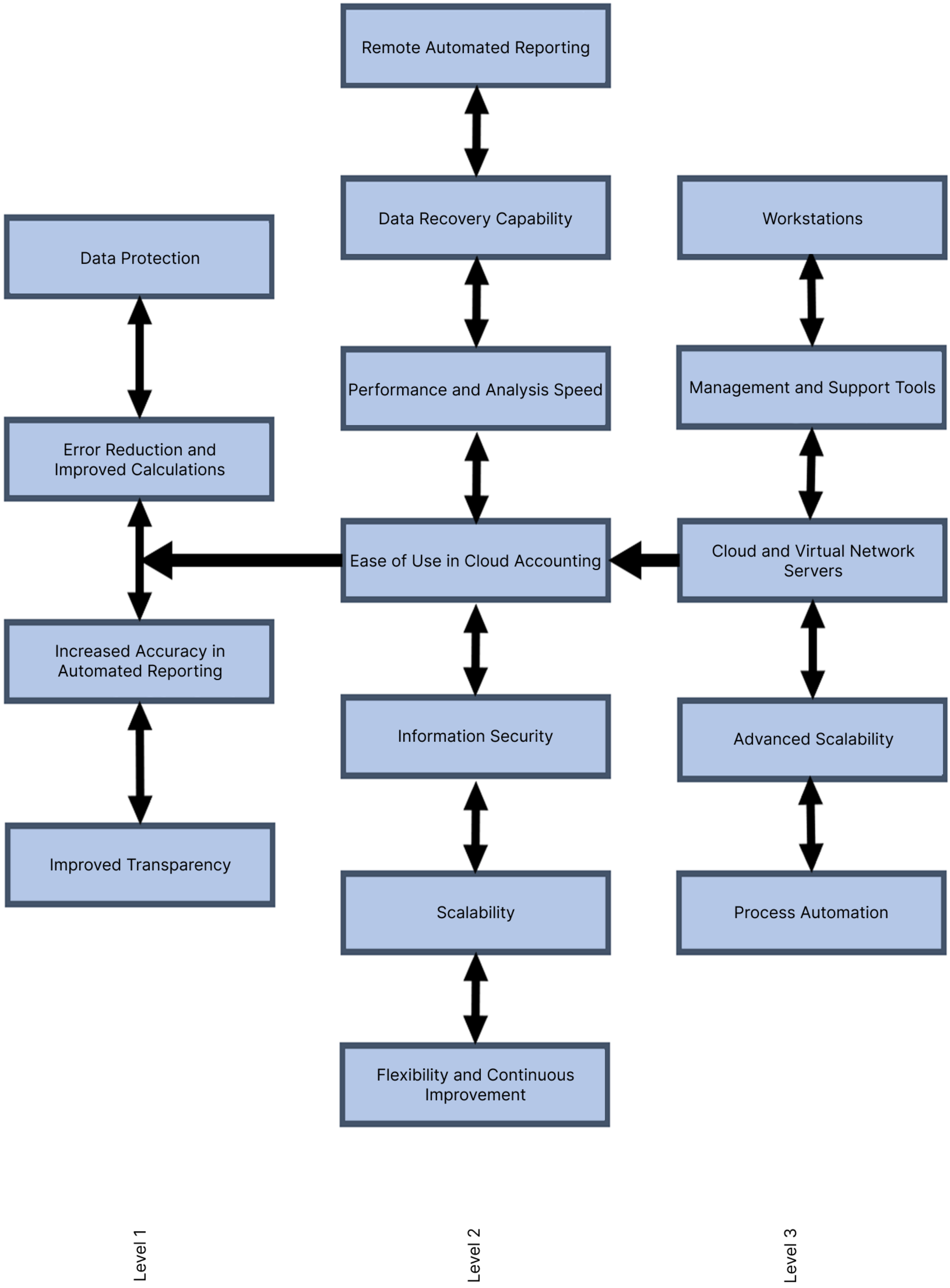

Remote Automated Reporting
Data Recovery Capability
Workstations
Data Protection
Performance and Analysis Speed
Management and Support Tools
Error Reduction and Improved Calculations
Ease of Use in Cloud Accounting
Cloud and Virtual Network Servers
Increased Accuracy in Automated Reporting
Information Security
Advanced Scalability
Improved Transparency
Scalability
Process Automation
Flexibility and Continuous Improvement
Level 1
Level 2
Level 3

Figure 1. Initial ISM Model

As illustrated in Figure 1, the 16 factors of the model are distributed across three levels:

- **Level 1**: Factors 13 (Improved Transparency), 14 (Increased Accuracy in Automated Reporting), 15 (Error Reduction and Improved Calculations), and 16 (Data Protection) — these are the most influenced and dependent factors in the model.
- **Level 2**: Factors 6 (Flexibility and Continuous Improvement), 7 (Scalability), 8 (Information Security), 9 (Ease of Use), 10 (Performance and Speed), 11 (Data Recovery Capability), and 12 (Remote Automated Reporting) — these factors influence Level 1 and are influenced by Level 3.
- **Level 3**: Factors 1 (Process Automation), 2 (Advanced Scalability), 3 (Cloud and Virtual Network Servers), 4 (Management and Support Tools), and 5 (Workstations) — these are the most influential and driving factors in the model.

Accordingly, the final ISM model is drawn and presented in Figure 2.

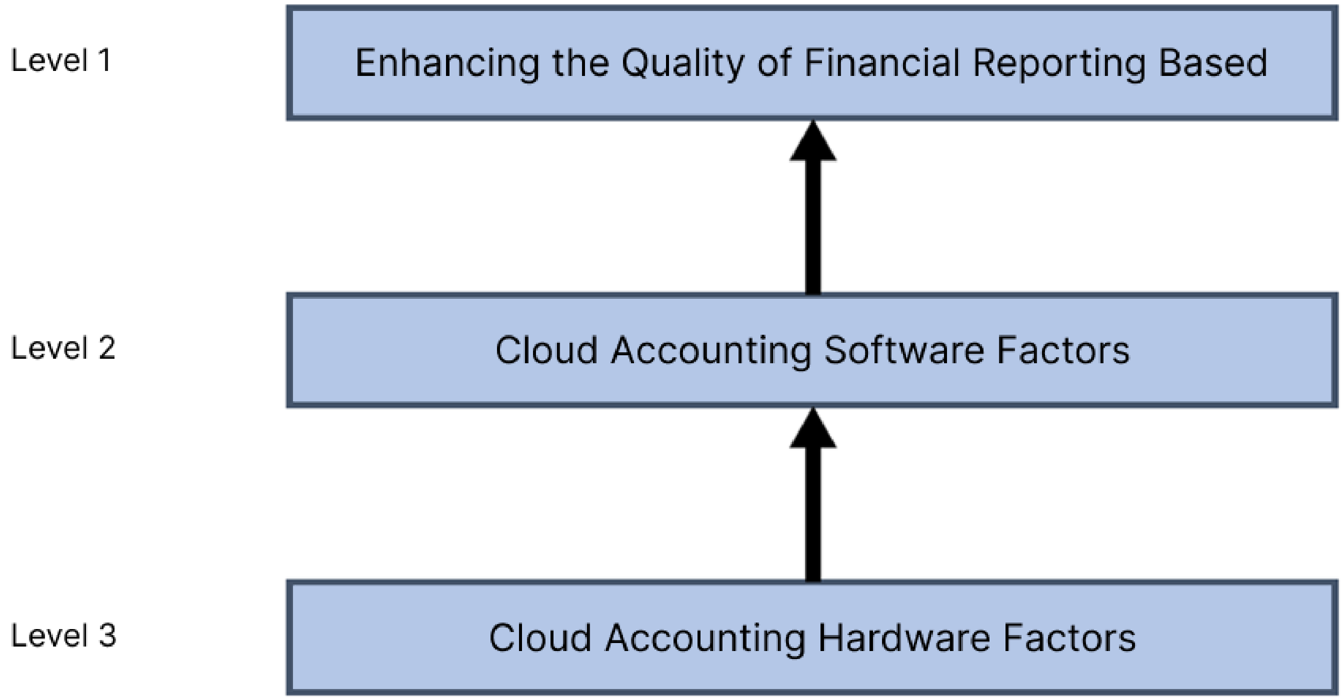


Figure 2. Final ISM Model

Step Seven: Analysis of Driving Power and Dependence (MICMAC Diagram)

At this stage, the factors are classified into four groups. The first group consists of *autonomous factors* (Zone 1), which have both low driving power and low dependence. These factors are relatively isolated from others and have limited connections. The second group, known as *dependent factors* (Zone 2), has low driving power but high dependence. The third group comprises *linkage factors* (Zone 3), characterized by both high driving power and high dependence. Any action on these factors will likely result in changes across other factors. The fourth group includes *independent factors* (Zone 4), which have high driving power but low dependence. Those factors with high driving power are referred to as *key factors* and typically fall into the independent or linkage categories.

Driving power and dependence are calculated by summing the "1" entries in each row and column, respectively, of the final reachability matrix. Based on this calculation, the power-dependence graph is plotted (Azar et al., 2013).

Using the data obtained in Step Four, the studied factors can be classified into the following four categories based on their influence on other factors (driving power) and their sensitivity to other factors (dependence):

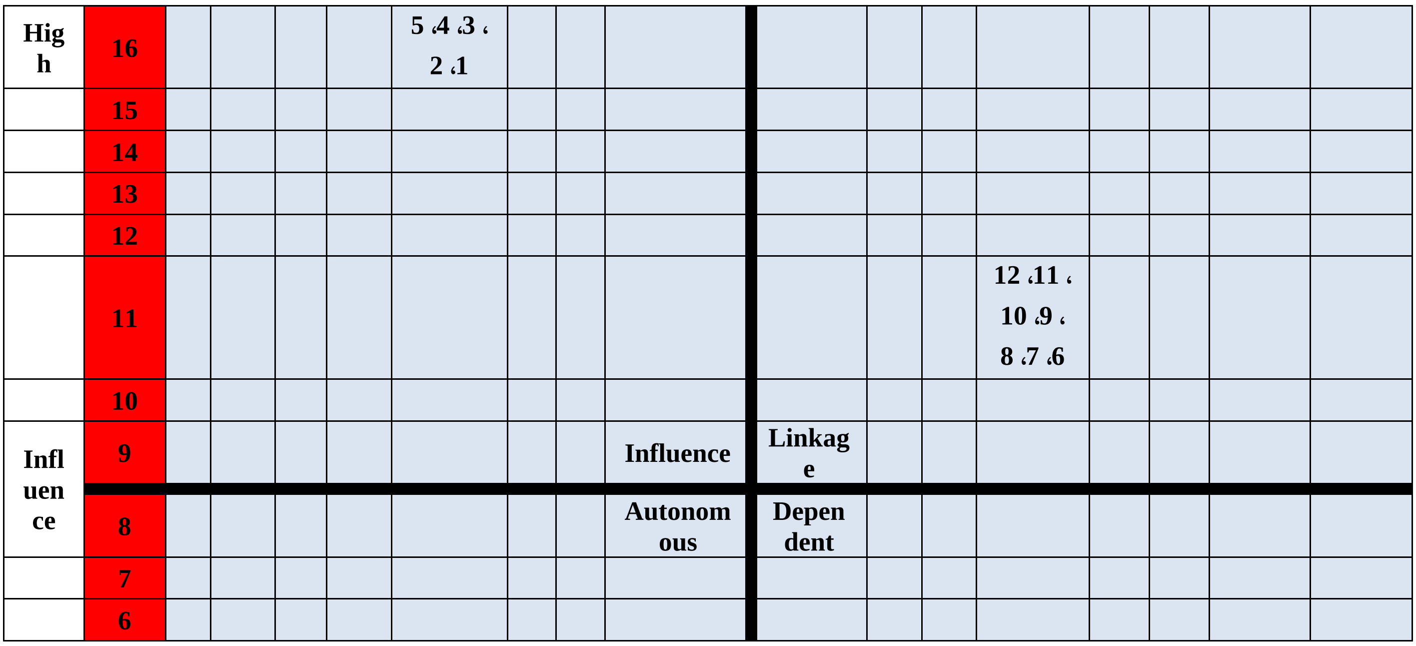
- **Autonomous**: Factors with minimal influence and minimal dependence.
- **Dependent**: Factors highly dependent on other variables.
- **Linkage**: Factors with two-way influence—high driving power and high dependence.
- **Independent**: Factors with substantial influence over others but low sensitivity to them.

To determine the coordinates of each factor on the MICMAC matrix, the driving power and dependence values of each factor are used, as derived from the final reachability matrix. Table 9 shows the driving power and dependence of each factor.

Table 9. Driving Power and Dependence of Each Factor

No.	Factors	Dependence	Driving Power
1	Process Automation	5	16
2	Advanced Scalability	5	16
3	Cloud and Virtual Network Servers	5	16
4	Management and Support Tools	5	16
5	Workstations	5	16
6	Flexibility and Continuous Improvement	12	11
7	Scalability	12	11
8	Information Security	12	11
9	Ease of Use in Cloud Accounting	12	11
10	Performance and Analysis Speed	12	11
11	Data Recovery Capability	12	11
12	Remote Automated Reporting	12	11
13	Improved Transparency	16	4
14	Increased Accuracy in Reporting	16	4
15	Error Reduction and Improved Calculations	16	4
16	Data Protection	16	4

Using the coordinates from Table 9, the MICMAC matrix is generated (Figure 3).



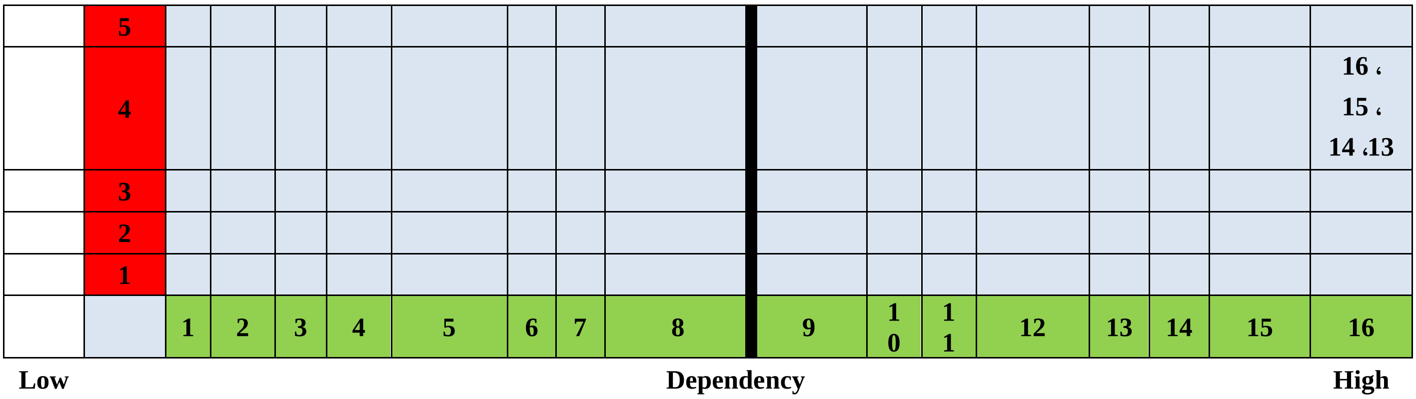


Figure 3. MICMAC Matrix

As shown in Figure 3, factors 13, 14, 15, and 16 fall into the *dependent zone*, indicating low driving power but high dependence on other factors. Factors 1 through 5 lie in the *independent zone*, showing high driving power and very low dependence, thus acting as drivers of the model. Factors 6 through 12 are categorized under the *linkage zone*, possessing both relatively high driving power and dependence.

These linkage factors play a key role in the model due to their dual sensitivity and influence—they are directly affected by the independent factors and exert influence on the dependent factors.

4. Discussion and Conclusion

The primary objective of this study was to identify and model the key hardware and software components of cloud accounting that influence the quality of financial reporting, using the Interpretive Structural Modeling (ISM) approach. The findings demonstrated that cloud accounting—through a structured combination of hardware infrastructure and software capabilities—can significantly enhance the quality of financial reporting across multiple dimensions, including transparency, accuracy, error reduction, computational improvements, and data protection. These results are consistent with the increasing body of literature that recognizes cloud accounting as a transformative tool for modern financial reporting systems.

The final ISM model presented three hierarchical levels. At the foundation (Level 3), hardware components such as process automation, advanced scalability, cloud and virtual network servers, management and support tools, and workstations serve as the most influential factors. These infrastructural elements provide the computational backbone necessary for ensuring secure, scalable, and efficient data handling. Similarly, Al-Okaily et al. (2023) reported that performance expectancy and system support play a vital role in encouraging the adoption of cloud-based accounting systems in SMEs [10]. The role of process automation, in particular, was underscored as a catalyst for improving data accuracy and reducing the reliance on manual input—factors directly contributing to error minimization and improved reporting quality.

At the intermediate level (Level 2), software-based capabilities such as flexibility, continuous improvement, scalability, information security, ease of use, performance and speed of data analysis, data recovery, and remote automated reporting function as critical mediators. These elements enable real-time accessibility and seamless integration across departments, facilitating effective financial analysis and reporting workflows. The alignment of these findings with prior studies is evident. Ouaadi and El-Haddad (2022) found that remote reporting, intention of use, and motivation significantly affected the decision to adopt cloud accounting. Their integrated TOE, DOI, and TAM framework supports the current model's emphasis on software functionality as a driver of reporting accuracy and transparency [15]. Furthermore, Sarraf et al. (2022) highlighted that information intensity and skilled labor increase the likelihood of outsourcing through cloud-based solutions, indicating that the sophistication and efficiency of software systems influence broader organizational decisions and capacities [4].

Level 1 of the ISM model comprises the direct outcomes of improved financial reporting: enhanced transparency, increased accuracy in automated reporting, reduced errors and improved calculations, and stronger data protection. These dependent variables are the most affected by the preceding layers of software and hardware inputs, reflecting a logical causality that is structurally supported by ISM. Previous studies reinforce the significance of these dimensions. Mahmoudi et al. (2023), through a grounded theory approach to sustainability reporting in Iranian listed companies, argued that data accuracy and integrity, largely influenced by digital reporting infrastructures, contribute to strategic decision-making and external stakeholder trust [13]. Moreover, Bayzidi and Ahmadi Dehrashid (2021) emphasized how digital infrastructures such as IoT and cloud technologies reshape accounting functions by improving traceability, reducing fraud risks, and enhancing transparency [14]—findings that resonate directly with the upper tier of the model presented in this study.

The MICMAC analysis further corroborated the centrality of these structural relationships by classifying hardware components as independent factors with high driving power and low dependence, while the outcome variables were categorized as dependent, with high susceptibility but minimal influence. Software capabilities were identified as linkage variables, having both substantial driving power and dependence. This classification is theoretically meaningful and practically significant. It confirms that while outcome improvements in reporting quality depend heavily on software features, the foundational influence originates from technological infrastructure. Tawfik et al. (2022), examining cloud adoption in Omani SMEs, identified compatibility and top management support as key enabling factors [12]. This aligns with the notion that robust hardware and executive commitment are essential precursors for deploying complex software solutions and realizing financial reporting benefits.

Additionally, the hierarchical layering of the ISM model affirms the systemic interconnectivity between organizational resources and strategic outcomes. As observed in the work of Al-Okaily et al. (2023), trust and performance expectancy contribute meaningfully to behavioral intention, which, in this study, would translate to the willingness of firms to adopt and invest in cloud infrastructure and advanced analytics tools [10]. The broader implication is that enhancing financial reporting is not a linear function of adopting a single technology but rather the outcome of a complex, multilevel integration of physical, digital, and organizational capabilities.

Another important implication drawn from this research is the practical synergy between cloud software features and the infrastructural backbone that supports them. Features such as automatic data processing, real-time reporting, and secure backup mechanisms not only enhance operational efficiency but also strengthen governance, auditability, and compliance. The interaction of these factors reflects the conclusions reached by Sarraf et al. (2022), who emphasized how process characteristics like task repetition and information intensity elevate the value proposition of cloud accounting systems [4]. Moreover, the automation features identified in this study reduce human errors.

Ultimately, the proposed ISM model presents a theoretically grounded and practically actionable framework that integrates and categorizes the determinants of financial reporting quality in a cloud accounting environment. It not only provides a strategic roadmap for technology adoption but also identifies which components must be prioritized based on their structural role and functional contribution. It is particularly relevant for firms operating in highly dynamic environments where real-time data access, scalability, and system reliability are critical to maintaining competitiveness and regulatory compliance.

This study, while comprehensive in scope and rigorous in methodology, is subject to several limitations. First, the sample size was restricted to a group of 18 accounting and auditing experts with experience in cloud accounting, which, although sufficient for ISM modeling, may limit generalizability across industries or geographic contexts. Second, the research focused on perceptions and qualitative modeling rather than quantitative validation of the proposed relationships. Third, while the model provides a useful theoretical structure, it does not measure the strength or statistical significance of the relationships among factors. Lastly, the technological environment is evolving rapidly, and the findings may need continuous updates to remain applicable with the advancement of cloud platforms and artificial intelligence integration.

Future research should consider employing mixed-method approaches that combine ISM modeling with Structural Equation Modeling (SEM) or regression analysis to validate the strength and significance of the inter-factor relationships identified. Additionally, longitudinal studies across various organizational sizes and sectors could reveal how cloud accounting adoption impacts financial reporting quality over time. Exploring the role of artificial intelligence and blockchain in further enhancing reporting accuracy, transparency, and fraud detection within the cloud accounting paradigm could provide valuable insights. Another promising direction would be to investigate cultural and regulatory differences in cloud accounting implementation across regions or countries.

Organizations, particularly publicly listed companies, should invest in cloud accounting systems that balance robust infrastructural support with dynamic software capabilities. Executives should prioritize automation, advanced scalability, and remote reporting functions to enhance accuracy and reduce reporting latency. IT and finance departments should collaborate to ensure seamless integration of hardware and software systems, ensuring that real-time access, data security, and reporting compliance are upheld. Additionally, ongoing training and change management initiatives are essential to ensure that employees can fully leverage the benefits of cloud-based financial systems and contribute to improved organizational decision-making.

Authors' Contributions

Authors equally contributed to this article.

Ethical Considerations

All procedures performed in this study were under the ethical standards.

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Conflict of Interest

The authors report no conflict of interest.

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